

A Three-Dimensional Analysis of Maxillary Sinus Congestion in Unilateral Cleft Lip and Palate

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Cleft lip and palate (CLP) perturbs osseous and soft-tissue development of the nasolabial regions, often resulting in chronic maxillary sinusitis and mucosal thickening (MT) of the maxillary sinus. This preliminary study quantifies maxillary sinus MT in children with surgically repaired unilateral CLP. We hypothesize that maxillary sinus MT is increased in children with CLP relative to controls. We define "MT" as the difference between the entire maxillary sinus volume and airspace volume. Cone beam computed tomography (CBCT) images of 8-14 yr. old age- and sex-matched unilateral CLP patients (n = 10) and controls (n = 10) were obtained (IRB approval # 1210009813). Both maxillary sinus and airspace surface areas (SAs) were measured on each individual CBCT slice in coronal view. SA measurements were summed and multiplied by voxel size (0.4mm) to obtain a volume. Paired t-tests determined whether maxillary sinus volume, air volume, MT (i.e. maxillary sinus volume – airspace volume), and percentage of MT (i.e. MT/maxillary size x 100) differed. A p-value of ≤ 0.05 was considered significant. Intra-class correlation assessed reliability and was high (0.99). Significant differences were found for several measurements: Maxillary airspace (non-cleft side vs. right side control *p-value* = 0.002; cleft-side vs. left side control *p-value* = 0.004), MT (cleft-side vs. left side *p-value* = 0.009), and percentage of MT (non-cleft side vs. right side control *p-value* = 0.002, cleft-side vs. left side control *p-value* = 0.002). Maxillary airspace was decreased by 30% (non-cleft side) and by 33% (cleft side). Percentage of average MT was 40% (non-cleft side) and 42% (cleft side) of CLP patients, but only 9% (left and right side) in controls. Surgically repaired CLP patients exhibit decreased maxillary airspace and increased MT relative to controls. CLP deformities are associated with MT. 3D imaging is useful for quantitatively evaluating MT of the maxillary sinus.

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